September 15, 2017

Peter Madden
Regulatory Compliance Lead
Lower Churchill Project

Dear Peter,

RE: Headpond Water and Sediment Sampling Program – September 15, 2017 Update

1.0 INTRODUCTION

In order to provide additional monitoring coverage of possible changes in methyl mercury concentrations in water during headpond formation, the provincial government requested an additional sampling program be implemented by Nalcor. Nalcor provided a program description to government and engaged Amec Foster Wheeler to implement the sampling program. This memo provides an update on information regarding the headpond water and sediment sampling program related to additional results. While partial updates have been requested and provided since the previous update on August 8, 2017, this memo provides all additional sample results since that memo.

2.0 SAMPLING PROGRAM

Sampling began on October 14, 2016 in an attempt to capture existing, natural methyl mercury concentrations before any headpond formation. Following re-impoundment in February 2017, a weekly sampling regime has been ongoing for all 11 sample locations (Figure 1) as per WRMD request. Water and sediment samples have been analyzed for total mercury, dissolved methyl mercury, and total methyl mercury as well as other parameters that are known to affect methyl mercury generation and transport.

3.0 HEADPOND FORMATION

Headpond formation was initiated again in early February 2017, with the first set of impoundment samples being collected February 6, 2017. Water levels at the time of last reported samples within this summary were approximately 20-21 m elevation.

133 Crosbie Road
PO Box 13216
St. John's, NL A1B 4A5
Tel +1 709 722 7023
amecfw.com

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Registered office:
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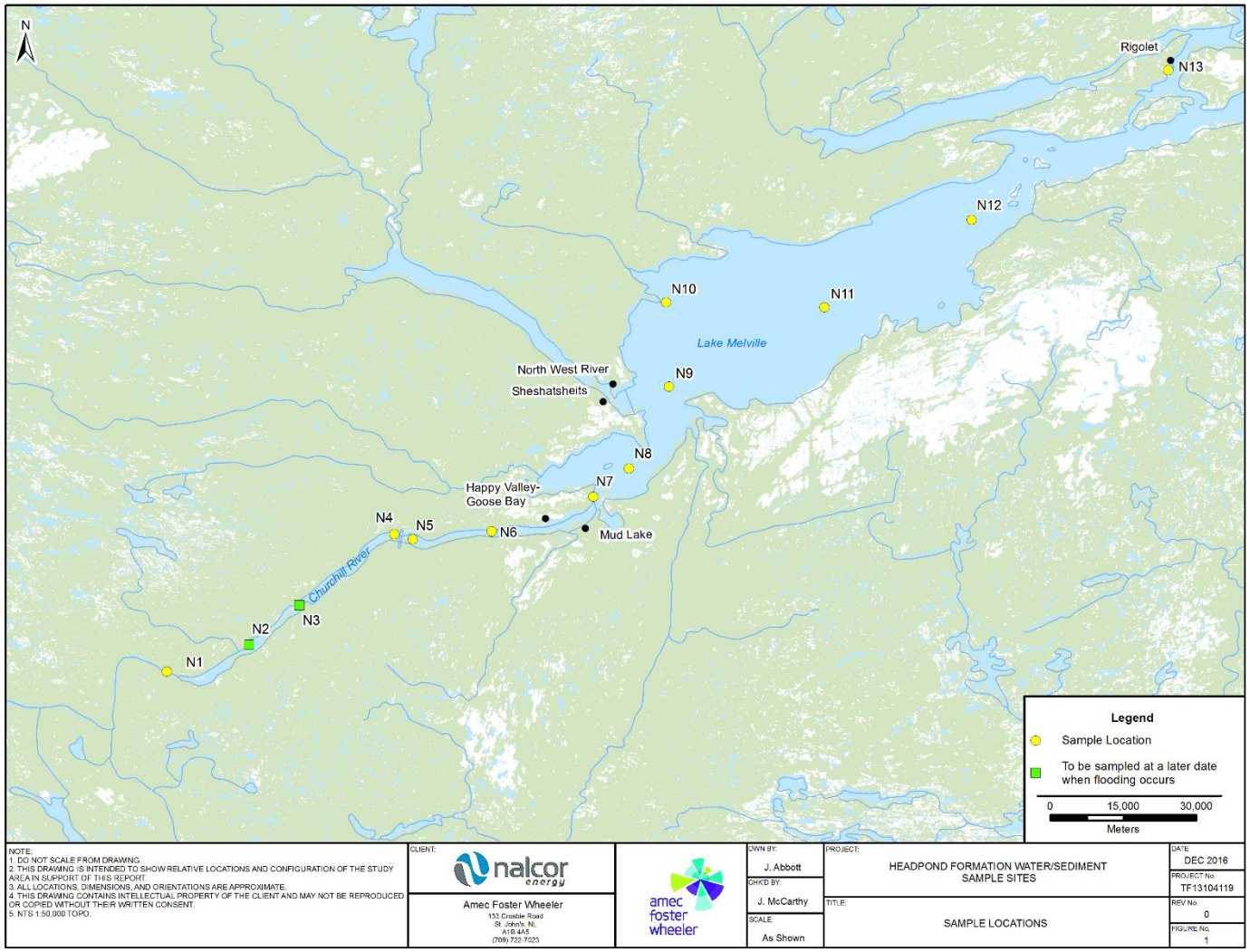

Figure 1: Map of sample locations, Lower Churchill River to Rigolet

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4.0 SUMMARY RESULTS

Sampling has continued throughout, and beyond, recent headpond activity to document any potential changes in natural, background methyl mercury in water and any potential changes due to flooding (Table 1). Each sample location is currently sampled on a weekly basis.

Table 1: Total number of samples collected from each sample site, as of August 21, 2017

Sample ID (ongoing)	Sample ID (from original plan)	Date of First Sample Collection	Number of Samples Collected
N1	1	Oct. 14, 2016	41
N2[1]	2	Oct. 14, 2016	2
N3[1]	3	Oct. 14, 2016	2
N4	4	Oct. 14, 2016	40
N5	5	Oct. 14, 2016	41
N6	-	Dec 20, 2016	29
N7	7	Oct. 14, 2016	35
N8	-	Dec 20, 2016	24
N9	8	Oct. 14, 2016	32
N10	-	Dec 20, 2016	25
N11	10	Oct. 14, 2016	33
N12	-	Dec 20, 2016	24
N13	11	Oct. 14, 2016	33

[1] Sample sites located above headpond elevation will be completed upon reservoir formation

Sampling has been ongoing with the last series of samples presented within this summary being collected on August 7, 2017. Results up to and including this week are pending analytical laboratory analysis.

As an example of the results within the dataset, a summary of existing total methylmercury results from several sample sites is provided in Figure 2. Site N5 is located directly downstream of Muskrat Falls and N8 (Goose Bay) is the first sample site within the Goose Bay / Lake Melville estuary downstream of the lower Churchill River. Site N8 was added to the sampling regime on the week of December 20, 2016. These sites would be anticipated to be the first to show any indication of downstream increases or transport in total methylmercury related to flooding. Also shown are the results for the upriver control site (Grizzle Rapids – Site N1 in Figure 1) which is located upstream of any reservoir influence. Figure 3 provides the results of dissolved methylmercury for the same sample sites and times.

As shown in Figure 2, there does not appear to be any increase in total methylmercury concentrations in water due to the initial inundation and flushing of the headpond in November; however, water samples after headpond re-formation in February indicated an increase at both Sites N4 and N5 at the time when headpond water levels had stabilized (around the week of February 28, 2017).

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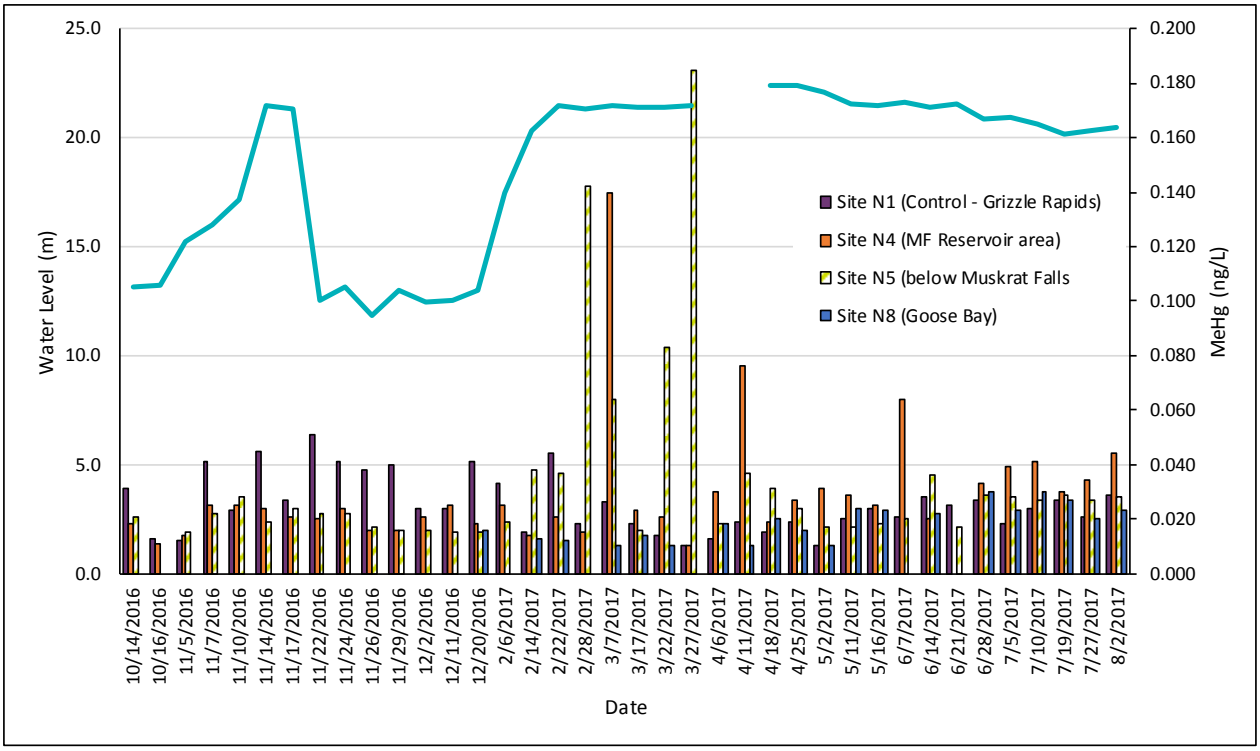
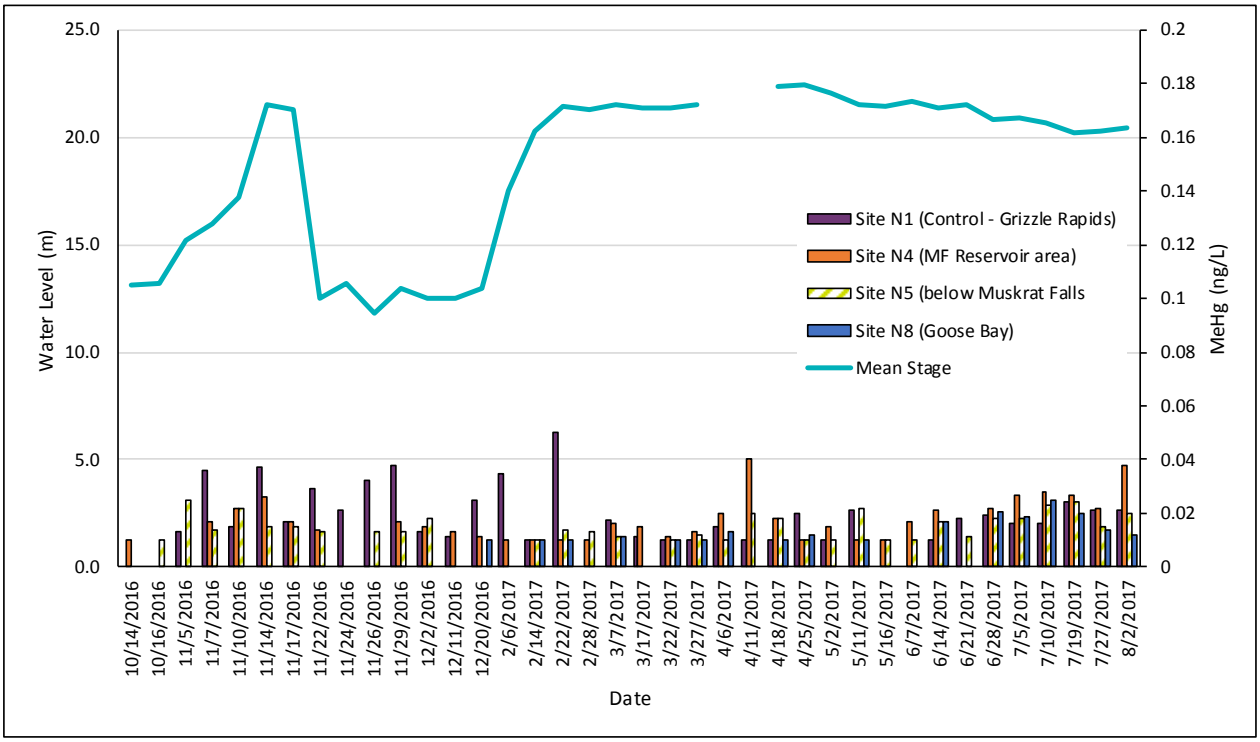


Water elevation data from October 14-November 18, and April has been provided by Environment Canada (Station Number 03OE015). Data post November 18 has been provided by Nalcor. Missing dates have been estimated based on data provided by Nalcor.

Figure 2: Total methylmercury concentration (ng/L) at various sample sites



Water elevation data from October 14-November 18, and April has been provided by Environment Canada (Station Number 03OE015). Data post November 18 has been provided by Nalcor. Missing dates have been estimated based on data provided by Nalcor.

Figure 3: Dissolved methylmercury concentration (ng/L) at various sample sites

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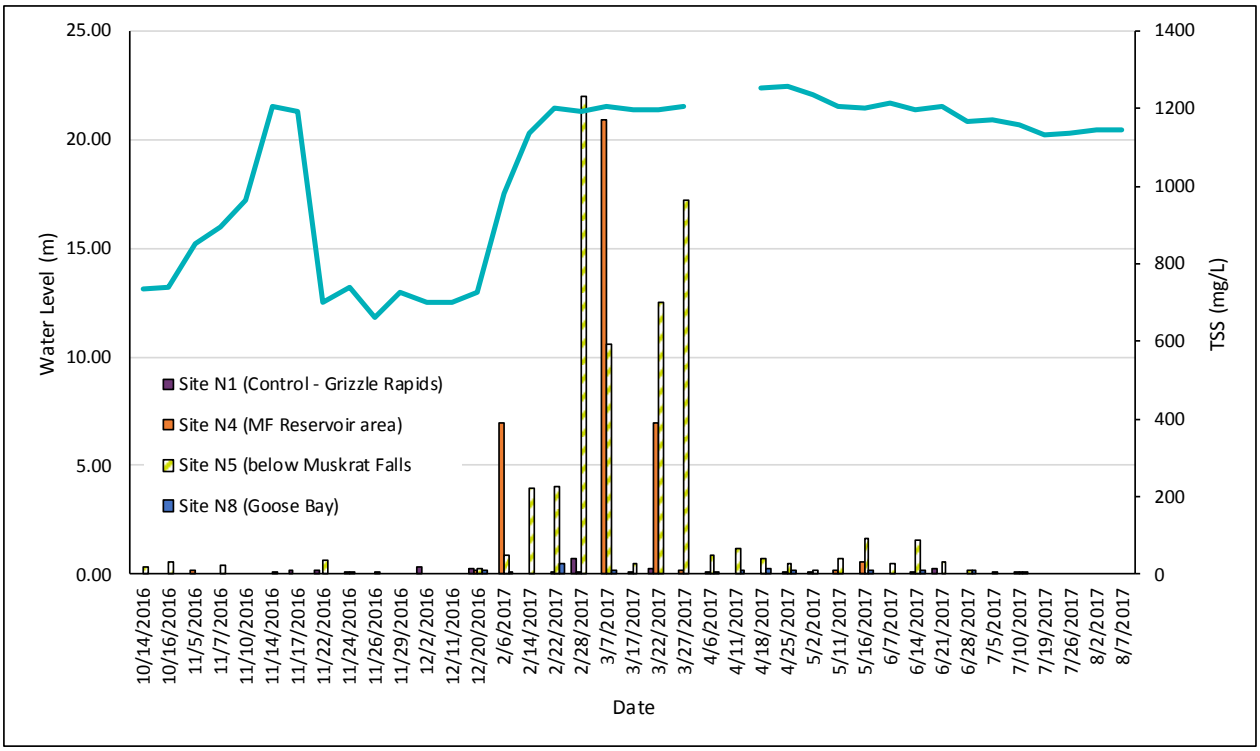
The values within the reservoir area (Site N4) appeared to quickly return to concentrations similar to those prior to any water level increase, with some indications of isolated, slight increases since headpond re-formation. Samples below Muskrat Falls (Site N5) also showed isolated increases at similar times and then also returning to similar levels as those prior to headpond formation.

Total methylmercury in Goose Bay does not appear to have shown any substantial increases above those concentrations entering the Muskrat Falls Reservoir area from farther upriver (defined as background sample location – N1). The higher concentrations of Total Methylmercury recorded during several weeks in February-March, 2017 within N4 (headpond) and N5 (below Muskrat Falls) were likely the result of increases in total methylmercury bound to particles within suspended sediments. Figure 4 shows Total Suspended Sediment (TSS) concentrations. Total methylmercury increases occurred similar to increases in TSS during the same weeks. This is supported by dissolved methylmercury concentrations which did not show any similar increases and therefore methylation due to flooding caused by bacteria activity was not evident.



Water elevation data from October 14-November 18, and April has been provided by Environment Canada (Station Number 03OE015). Data post November 18 has been provided by Nalcor. Missing dates have been estimated based on data provided by Nalcor.

Figure 4: Total Suspended Sediment (TSS) concentration (mg/L) at various sample sites

While statistical analysis has not been completed, total and dissolved methylmercury concentrations during the warmer sampling period (June – August) appear to show slight increases from previous colder sampling events; however, these increases have been recorded at all sample locations (see Figures 2 and 3) including the upriver background/control station (N1). It is noted that highest concentrations are within

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the headpond sample station during all "warmer" sample events, which could be caused by increased microbial activity and increased access to flooded material within the headpond. It is also noted, however, that these slight increases do not appear to be transported downriver as most concentrations within Goose Bay (N8) remained similar to those at the upriver control/baseline (N1).

In summary, concentrations of total and dissolved methylmercury measured within the sample stations have generally remained low. During a period of several weeks in February-March, some total methylmercury concentrations increased within stations N4 (MF Reservoir area) and N5 (below Muskrat Falls); however, concentrations did not show a similar pattern farther downstream (N8 – Goose Bay). Similarly, during the warmer sampling period (June – August), a slight increase in total and dissolved methylmercury concentrations was observed within all stations shown in Figures 2 and 3. Highest concentrations were recorded within the headpond station, which could have been caused by increased microbial activity and increased access to flooded material within the headpond. However, these slight increases do not appear to be transported downriver as most concentrations within Goose Bay (N8) remained similar to those at the upriver control/baseline (N1). Any cumulative trend in downstream methylmercury concentrations is not evident.

The highest concentration of total methylmercury measured to date is 0.185 ng/L at the site below Muskrat Falls (N5) and this concentration was not sustained for any duration. Most total methylmercury concentrations have remained below 0.050 ng/L. The lab's accredited detection limit for both total and dissolved methylmercury is 0.010 ng/l. All results to date for all parameters tested have been provided to Nalcor and government and are available. As more data becomes available, it will be provided.

If you have any questions, or require any further information, please feel free to contact me at your convenience.

Yours sincerely,

Amec Foster Wheeler Environment & Infrastructure,
a Division of Amec Foster Wheeler Americas Limited

Prepared by

Matthew Gosse, B.Sc
Environmental Biologist

Reviewed by

James McCarthy, M.Sc., CFP
Associate Biologist

David A. Robbins, M.Env.Sci.
Associate Scientist

cc: David Robbins

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